

LI.—On the History and Habits of the *Epeira Aurelia* Spider.

By FREDERICK POLLOCK, Esq.

I AM not aware that the history of a spider has ever been written ; and I am therefore induced to give the result of my observations in Madeira, in 1864–65, upon the *Epeira Aurelia*, which I watched very closely, day by day, for some months.

The favourite haunt of this spider is the prickly pear—a plant from which its cocoon can scarcely be distinguished in colour, and so close is the resemblance that, the first time I saw one of these cocoons, I could hardly believe that it was not a withered piece of the cactus to which it was attached.

This cocoon (which is always made in one night) is composed of an inner, soft, globular covering for the eggs, surrounded by a tough, parchment-like case, about the size and shape of half a small walnut, of a faded light-green colour, and is suspended by a number of threads, stretching out in all directions to the surrounding plants. It is water-tight, and inaccessible to ants, which are almost the only enemies to spiders in the island ; and it contains from about 600 to 1000 bright yellow eggs, glued together in the shape of a bean.

By cutting several cocoons open, I ascertained that the eggshells burst at the end of the fourth week. The young spiders are then very helpless, and nearly transparent. At the end of the fifth week they cast off their first skin, and become quite lively and active.

They are at this time about as large as an ordinary pin's head, of a bright yellow, with darkish legs ; and three or four dark spots gradually develop themselves down each side of the abdomen. At about the end of the seventh week they emerge through a small hole (probably gnawed by them) from their prison, never to return to it.

They then club harmoniously together, hanging closely packed in a ball, upheld by an infinity of lines which they attach to the adjacent objects.

For the first ten days or fortnight of their freedom they thus live in amity, occasionally spreading out (probably for ventilation), but always, during that time, reverting to the form of a compact cluster, and eating nothing.

When the fortnight is over, their friendship ceases ; sometimes all of them, and invariably most of them, wander away, a very few remaining behind near their birthplace.

Hitherto they have merely made lines ; now each individual makes a web for itself, about as large as a penny piece, to catch its neighbour, or any other prey which may come within its clutches.

From the extreme tenuity and want of strength of these webs, there are very few insects feeble enough to be held by them; and the consequence is, that hundreds of the spiders, at this precarious period of their existence, perish from starvation or other causes, and I have been led to the conclusion that not more than one or two (if so many) out of each cocoon survive, though, having once passed this period, very few of them appear to die until the natural time arrives.

It is next to impossible to watch them closely, or speak with any degree of certainty about them, at this early stage of their life, not only on account of their being so small, but because they are then exceedingly migratory. If there be a gentle breeze and they feel so disposed, they float away on the light gossamer threads they can let out to almost any distance they please, without one's being able to prevent it.

In the hope that I could the better observe them, I had a large glass case made to keep them in; but I found that they did not thrive well in captivity, especially at this period of their life; for, amongst thousands confined for four or five months, not one appeared to grow larger, or change in any respect, except perhaps to become a little darker.

In the glass case the young ones never made webs, but merely lines; and, without a regularly constructed web, spiders scarcely have the power, or apparently the inclination, to catch prey: so they gradually died off.

"It is all fish, however, that comes to the spider's net." They make no distinction between a brother and a blue-bottle fly; and though the young did not live upon each other in confinement, they were food (and the only convenient food I could get) for some others of a size larger in the glass case, which did make webs.

A fortnight after the young spider leaves the cocoon, it begins to construct snares, to feed, to grow, and to become darker.

I cannot say positively, but I believe, in a month or two from that time, according to the food it gets, it changes its skin.

The females have nine changes after leaving the cocoon. From the first to the eighth these changes take place pretty regularly, under favourable circumstances,—in times increasing gradually from about fifteen to twenty-five days, though one spider in the glass case (having had one or two changes) remained for forty-five days without changing, and then died.

For about two days preceding each change the spider seems to eat nothing, and to remain motionless.

The operation of getting out of the old skin is a strange-looking performance, and is thus effected:—The spider is fastened firmly, by a thread from the spinnerets, close to the underside

of the web: the legs are all gathered together, and likewise appear to be fixed to a spot close by: the body hangs downwards, the skin begins to split at the sides, and the spider, by a succession of powerful efforts, lasting about half an hour, gradually draws its legs out of the old skin.

When fairly freed, its former attitude is reversed; for it hangs with the end of its abdomen uppermost, and its legs dangling loosely down (a position it never assumes at any other time); and so little does it look like its ordinary self, or anything else that I know of, under these circumstances, that one is puzzled on first seeing it in this posture to imagine what it can be.

The legs are now quite soft, flexible, and semitransparent, the abdomen slender, and the spider very feeble and exhausted.

It can scarcely crawl, or exert itself in any way. It remains stationary for about an hour, then turns its legs up, and climbs by its attaching-line to the web, where it remains motionless for for some forty-eight hours, after which it resumes its usual habits.

Should it at any time whilst young lose a limb or part of one, nothing appears to occur towards its reproduction, until at least one subsequent change of skin has taken place; some time after which, the leg or part of it grows again, but is not much more than half the length of the corresponding perfect part, and is of a somewhat lighter colour.

These stunted limbs are of little use to the spider; and, as far as I could make out, there is no reproduction at all of limbs lost after the seventh change of skin.

I have said that the changes take place regularly from the first (after leaving the cocoon) till the eighth. Then the spider is adult, and begins making cocoons—the first in a month's time, and others at periods within from about fifteen to twenty-five days apart.

About a week after the fifth cocoon has been made, the spider changes its skin for the last time, rests from its egg-laying for about thirty days, makes five more cocoons at intervals of from fifteen to twenty-five days, and dies a week or so after making its last one.

The spots which the young spiders have on the sides of the abdomen gradually disappear, and give place to very handsome markings of regular and even transverse bands of silver and orange across the abdomen, alternating with black, a silvery thorax, and transverse stripes of brown and black on the legs; but as this spider's appearance has been described by Walckenaer, it is unnecessary for me to say more about it, except that the largest females have a body $\frac{1}{6}$ ths of an inch long, and a fore leg $\frac{2}{16}$ ths, which is very much larger than our largest British garden-spider.

Hitherto we have been treating only of the females. There is a very great difference between their size and that of the males, the latter, when full-grown, being only $\frac{3}{16}$ ths of an inch long, with a fore leg $\frac{1}{2}$ an inch. Moreover the male has only four changes of skin, which appear to take place at much the same periods as the corresponding changes of the female. Indeed the habits and history of both sexes are precisely similar until the fourth change, but no longer. The male then entirely ceases making webs, eats nothing, and, from having been very sedentary, becomes a rover, wandering about from web to web of the females. His abdomen, from want of food, shrinks; and his thorax, partly from contrast, and partly owing to his large palpi, bears a different proportion to that of the females, and makes him rather unlike them.

This spider makes a flat, circular web, which it hangs in a nearly vertical position. The webs of the youngest have the same beautiful symmetry as those of the oldest spiders. They consist of strong, tightly stretched, and inadhesive radial lines, crossed by a much thinner and looser spiral line, or concentric circles, which are very sticky.

In a full-sized web there are about 250 feet of thread, made up of about 35 radial lines and 38 concentric circles, the outer of which is some 20 inches in diameter.

The web is almost invariably constructed at or near early dawn, seldom or never during the day, the old one being destroyed before a new one is begun.

The radial lines are first made; then the outer circle, from which the spider, walking round and round the web, and working towards the middle, lays down the spiral line, joining it to the radial lines wherever they cross each other.

At a distance of about two or three inches from the centre this gummy line ceases, and there is an interval sufficiently large to allow the spider to creep through to the other surface of the web; the spiral line is then resumed, rather irregularly, to the centre, but it is no longer adhesive, so that the spider has always a dry and comfortable resting-place.

Sometimes (though not always) it works upon the web, and from its centre, a broad, white, zigzag line of thread, in a vertical direction; and I am inclined to think from this, that a certain quantity of the web-producing fluid is daily secreted, and, if there be any surplus, it is got rid of in this elegant manner, which the natives of Madeira call "writing the spider's name" on the web.

After the lapse of a day or two, the adhesive property of the web disappears, and it no longer catches flies: a fresh one must consequently be made, sometimes daily, sometimes after two

days, according to circumstances ; but, unlike the house-spider's, this web is never repaired.

When finished, the spider suspends itself by a double attachment from the centre of the under side ; that is to say, it attaches its abdomen by a line, and it holds on with its legs ; and so, if it should get alarmed, it can at once let go its hold with its legs, and, after dropping a foot or two, stop, without falling far enough to get injured by striking the ground underneath ; and this power that it has of suddenly stopping in its fall shows, I think, that the fluid from which the thread is made has the singular property of drying instantaneously.

In the middle of their webs, the spiders constantly hang, with their head downwards, waiting patient and motionless until accident shall have brought some kind of prey into their snare.

Their sensitiveness to the struggles of a captured insect is quite astonishing ; for, without seeing or going near to it, the spiders are at once aware if the insect is unsuited to them, and, should such be the case, they either let it alone or by violent jerks shake it off. Again, when a gale of wind is blowing, and one would imagine that all other motion would be absorbed in the tremendous agitation of the web, the spider immediately knows when a fly is caught, and hurries down to seize it, at the risk of being blown away itself.

Should a wasp, bee, or other formidable creature be captured, they approach cautiously, keeping it at arm's length ; then spreading out their spinnerets to get a broader thread, wind the insect round and round, till it is encased like a mummy, and can no longer offer resistance, and then triumphantly carry it off to the centre of the web, where they always devour their food.

The most formidable thing I ever saw one of them conquer was a very large humble bee, so much heavier than the spider that the web could only just sustain its weight. The *Epeira* did not hesitate, however, but at once walked down to it, rolled it up, and in a very short time put an end to its struggles and its life.

It is remarkable that the spider is never attracted to anything which does not move, and consequently never eats what it has not itself killed. If two insects happen to be caught at the same time, one is first rolled up, then a line attached from it to the centre of the web, and then the other is treated in precisely the same way ; but no insect is ever rolled up without having a line made from it to the centre of the web, and this line unerringly and at once leads the spider to the prey it may have captured hours ago. As far as my observations go, I believe that spiders generally are guided much more by the sense of feeling than of

sight. I have seen a large insect almost touching a spider in its web, but terrified and motionless; and as long as it remained thus, the spider did not take the least notice of it, not knowing apparently that it was there; directly, however, it began to move, it was attacked and rolled up.

I have said that the young spiders are very migratory. After a change or two of skin they are equally stationary, and will, I believe, if they find a suitable place, never move more than a foot or two from it during their life, making web after web, and cocoon after cocoon, in almost identically the same spot.

They appear to be quite harmless to man, as I have frequently handled the largest with perfect impunity.

Their voracity, which is very great, is only equalled by their powers of endurance; for they will live for a week or ten days without food, and apparently without being much the worse for it. One male spider, which I had in a glass case, remained for forty-eight days, after its final change, without eating; and when I let him go, he was quite brisk and lively. I may also mention that when it was necessary that an adult spider should be weighed (in order to find the rate at which they grow), thinking that the quickest and easiest manner of ending its life would be to put it into hot water, a jug was brought, the spider dropped in, and it apparently died at once; so, taking it out of the hot water, I dried it thoroughly, and put it into the scales. To my utter surprise, it began, after a while, to show signs of returning life. When sufficiently recovered, I placed it carefully back into its web, and from that time forth it was just as healthy a spider as any untouched one, perhaps all the better for its cleaning and its bath.

I found that at the end of eight months it is 2700 times as heavy as at its birth!

The nutriment it takes during the first half of its life is devoted entirely to increasing its size; that of the last half almost as entirely to the production of eggs.

We have seen that it has altogether ten changes of skin—one in the cocoon, and nine out of it; and that it makes ten cocoons, and lays about 8000 eggs.

So regular are the habits of this spider, that it may be likened to a machine which is made for performing a given amount of work and no more. If it can procure an abundance of food, it will live for about eighteen months; and it may appear somewhat anomalous, but nevertheless I believe it to be a fact, that by lengthening out the time in which it gets its food you may considerably prolong its existence, though you cannot get more work out of it, either in the shape of growth, or changes of skin, or laying eggs.

The history of one *Epeïra Aurelia* is the history of the whole species.

It works with the most consummate skill; but when it has made its marvellous snare for the capture of prey, it trusts to accident alone, and uses no artifice to entice that prey. So also with regard to its cocoon. Nothing could be more perfectly adapted to the purpose for which it is intended; but directly this beautiful structure is finished, the spider is utterly indifferent to, and apparently ignorant of, its existence, which is proved by my having always taken away the cocoons the morning after they were made, without producing the slightest effect upon the *Epeïra*.

Thus they are governed in everything they do by an all-wise and immutable law, which compels them, so to speak, to make the best provision for themselves and for the protection of their eggs—for the permanence and reproduction, in short, of their race; and this, it would seem, is the end and aim of their existence.

Thurlow, Clapham, S., May 1865.

LII.—Notes on the Hydroida. By Prof. ALLMAN, F.R.S.

I. *Syncoryne pulchella*, mihi, n. sp.

IN April last I obtained at Skelmorlie, on the Firth of Clyde, a pretty little Corynidan Hydroid, which might have been seen spreading in small patches over the bottom of the rock-pools near low-water mark. It turns out to be a species of *Syncoryne**, distinct from any hitherto described, and may be defined by the following diagnosis.

Trophosome.—Hydrocaulus consisting of simple stems rising at intervals from a creeping reticulated stolon, and attaining a height of about half an inch; periderm destitute of annulation, and only with a few shallow transverse corrugations towards the base. Polypite with fifteen to twenty tentacles. Body of polypite deep orange, becoming pale where it passes into the stem; stem orange.

Gonosome.—Gonophores borne on short peduncles in a dense cluster immediately behind the most posterior tentacles. Um-

* The name of *Syncoryne*, adopted from Ehrenberg in a restricted sense, is intended to embrace those species of the older genus *Coryne* which have phanerocodonic gonophores, referable, at the period of their liberation, to the type of *Oceania* as limited by Forbes and, still more definitely, by Gegenbaur. (See a paper on the genera of the Hydroida in the 'Annals of Nat. Hist.' for May 1864.)